

PATENT SPECIFICATION

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COMPLETE SPECIFICATION

Improved Process and Apparatus for Deodorizing and Sterilizing Air

I, GIUSEPPE BRUZZONE, an Italian Citizen, of 19, Corso Vinzaglio, Turin, Italy, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to processes for producing hydrogen peroxide vapours by the combination of ozone with moist air, more especially for deodorizing and sterilizing the air of rooms and other enclosures and also to apparatus for carrying out such process.

Hitherto, as is well known, ozone, obtained through suitable devices, was utilized, among others, to sterilize and deodorize the air of rooms. This ozone has, however, a very penetrating odour and disseminates in an almost uniform way throughout the ambient atmosphere of the enclosure.

The odour of ozone is distasteful and in some instances even noxious to persons who are in the room where the apparatus is placed, especially to sick persons who are present.

The invention has for its object to obviate such a drawback and provide a process which is adapted to produce a slow hot air stream, rich in water vapour and ozone, which is then converted to hydrogen peroxide. Such a stream, inasmuch as it is composed of hot air, rises to the upper region of the room concerned, which is the natural location for odours, bacteria or similar objectionable matter, where the hydrogen peroxide decomposes, so forming nascent oxygen which, as is well known, is one of best sterilizing and deodorizing agents now known. Therefore, the oxygen acting in the nascent state, manifests itself right in the region where the maximum concentration of odours, bacteria and similar matter exists, and this allows the

maximum efficiency to be obtained, as well as the sterilizing and deodorizing of the air to be effected at a certain distance from persons present. Moreover, the vapours produced by the apparatus are odourless and can, therefore, be delivered within any room, even if ill persons are present.

According to the present invention, the apparatus to produce hydrogen peroxide vapours according to a first embodiment, which appears to be particularly suitable for relatively small rooms, comprises a container for water, some heating means for the water within the container, an ozone generating device, an annular cylindrical container provided with openings communicating with the room or enclosure and placed at different levels; heating means are provided in such container which are intended to create a rising air current, the water vapour produced by the air heated in the container and the rising air current and the ozone converging at a point of the container in such a manner as to form at the exit of the container a rising current of hydrogen peroxide.

The means heating a section of the container, intended to produce the rising hot air current, can be composed partly of the heat contained in the hot water vapour and partly of the same means which heats water which is in contact with an internal side of a section of the wall of the container, the external side of which is in contact with the air.

According to a suitable form of the invention, the apparatus is composed of two coaxial cylindrical portions having a vertical axis, one of the portions having a larger diameter, while the other has a lesser diameter, such portions being connected at their bases through an annular rim, in order to form a substantially toroidal launder for the water to be heated;

the external portion projecting, furthermore, in the upper direction and being closed at the top by a circular cup provided with holes. In the top portion of the so formed chamber the ozone generating device is placed and the device is provided with supporting feet resting on a supporting plate, in order to allow the air to circulate inwards, within the portion of the tubing of lesser diameter, the water heating being obtained, for instance, by an electric immersion resistor having a circular shape and immersed in the water.

The two coaxial cylindrical portions, the circular rim and the cover of the above described apparatus can be composed of a plastic material. Furthermore, the means to supply power to the ozonizing device and/or to the electric immersion heater can be intermittently controlled through an automatic time-regulated device.

Such an intermittent cycle operation appears to be advisable when persons having heart or respiratory diseases are in the room.

Optimum results were gained through the use of an apparatus according to the present inventions, said apparatus being adapted to deliver 6 cubic meters of hot air enriched by hydrogen peroxide vapours, by adding to the water vapours 2, 7 thousandths of a gram of ozone per a cubic meter of moistened air, i.e., by an humidification of 8.33 grams/cu. meter of air, the model in question producing 1 gram of ozone in 25 hours and evaporates in same time 1250 grams of water.

The sterilizing efficiency of the apparatus amounts to about 85% and the water is kept at a temperature of about 55°C.

According to another form of apparatus for carrying out the present invention, this particular form being particularly suitable for public premises, hospitals and industrial applications (as for instance the performing of the oxidizing function during the wool bleaching), the device is substantially composed of an elongated envelope (which is to be arranged in an horizontal direction), said envelope being provided, at its middle section, with a container for the water, with means to keep the water level constant and with means to heat the water at constant temperature in order to humidify an ozonized air current passing through said container. At one end of the envelope a group of transverse ozonizing members is arranged, these members being of a *per se* known type, and an air blower which causes the passage of the air current through said ozonizing members and through the whole of the device, while at

the opposite end a conduit is arranged, to allow the mixing of the air with the water vapour and the ozone.

Further advantages and features of the present invention will appear more clearly from the following specification, to be read with reference to the accompanying drawings, in which:

Fig. 1 is an elevation, in section, of a first form of the device of the invention;

Fig. 2 is a plan view of the device shown in Fig. 1;

Fig. 3 is a longitudinal section of a second form of said device, and

Fig. 4 is an horizontal section of the device shown in Fig. 3.

Referring first to Fig. 1 and Fig. 2, the numeral 1 indicates a portion of tubing which is joined to the portion 2 of the external tubing by an annular rim 3 forming a launder or water container.

The external tubing 2 projects in a vertical direction and is closed at the top by a cover 4 of inverted cup form and provided with holes 5 and the apparatus is provided with feet 6 which serve, when it is placed upon a plane surface, to space the base of the apparatus from that surface, in order to allow the inlet of air through the inner tube 1, the upper end of which is open to the interior of the apparatus.

The water is heated to the desired temperature through an electric immersion resistor 7 the upper part of which heats the air in the chamber, supported by a bracket 8 connected to a plate 9, which rests in turn on the top rim of the tube portion 1, by means of legs 10. On said plate 9 the ozonizing device 11 is also arranged and the power transformer 12 supplying the energy to the ozonizer.

On the device an electrical junction box 13 is arranged, to which the electric supply wires arrive, and a switch 14 serving to connect the ozone generating device to the supply network. A trough or funnel 15 on the outer tube 2 is provided to enable the water to be replenished to control its level within the container.

Referring now to the embodiment represented in Figs. 3 and 4, the device is composed of an elongated shape envelope, which is open at the ends and includes a centre portion 16 serving as a tank to contain water, and two end portions indicated by numerals 17 and 18.

Within the centre tank 16, a cock 19 is arranged for securing a continuous water supply: it is controlled by a float 20; furthermore an electric resistor 21 and a thermostat 22 are arranged within the tank, said thermostat being adapted to control the current supplied to said resistor, in order to keep constant the

water temperature.

Within the portion 17 of the envelope a transverse group consisting of an ozonizing member 23 and an air blower 24 are contained, the rotor of which is placed at the inlet of envelope 17.

On the portion 18 of the envelope, facing the above-mentioned portion, a small rim 25 is formed at the end, by turning down the edge, in such a way as to hold the droplets which are formed during the operation of the device, said droplets being returned to the container 16, by flowing along the slightly inclined bottom of the portion 18.

The air stream, caused by the air blower 24, impacts against the group of ozonizing members 23, so gaining an enrichment of ozone and such stream flux is caused, by a deflection diaphragm 26, arranged crosswise in the top portion of the container 16, to bend down towards the bottom portion of the container itself, where the heated water is contained, so mixing the air with the water vapours.

Within the end portion 18 of the envelope takes place the intimate mixing of the air water-stream and the ozone and the exit toward the ambient atmosphere of air current rich in hydrogen peroxide vapours, said air being particularly adapted to obtain the desired air conditioning.

What I claim is:—

1. A process for deodorizing and sterilizing the air of rooms or other enclosures characterised in that a slow, hot and preferably rising, moistened air current is produced, to which current ozone is intimately mixed, and to a large extent dissolved in the water vapour, so producing hydrogen peroxide, which in turn produces nascent oxygen.

2. Apparatus for producing hydrogen peroxide vapour, especially for air deodorizing and sterilizing, by the process claimed in Claim 1, characterised in that it comprises a container for water, means to heat the water, an ozone generating device, an annular cylindrical container provided with openings communicating with the ambient air said openings being placed at different levels, heating means being arranged within said container which are intended to create a slow rising air current, the water vapour produced by the water heated in the container and the rising air current, and the ozone converge at a point in the container in such a way as to form at the exit of the duct itself, a rising current of air which is moistened by water vapour and hydrogen peroxide vapour.

3. Apparatus as claimed in Claim 2, characterised in that the heating means of that portion of the container intended to produce the hot rising air current, is composed partly of the heat contained in the hot water and partly of the same means used to heat said water which is in contact with a side of a portion of the wall of the container, the opposing side of which is in contact with the air.

4. Apparatus as is claimed in Claims 2 and 3, characterised in that the container is formed by two coaxial cylindrical portions having a vertical axis, one of these portions having a larger diameter and the other having a lesser diameter, said portions being joined at the base by an annular rim to form a water container, having a substantially toroidal shape, the external portion projecting in a vertical direction and being closed at the top by a circular inverted cup provided with holes, the ozone producing device being arranged in the top portion of the chamber so formed, the apparatus being furthermore provided with feet in order to allow the admission of the air within the central cylindrical portion when said apparatus is placed on a plane surface, the water heating being furthermore obtained by an electric immersion resistor.

5. Apparatus as claimed in Claim 4, characterised in that the two cylindrical portions of container, the annular rim and the cover are formed by plastic material.

6. Apparatus as claimed in Claims 1 and 4, characterised in that the ozone generating device and/or the electric resistor are controlled by a time regulated device, intended to effect intermittently the connection of the resistor in the supply circuit.

7. Apparatus for producing hydrogen peroxide vapours, especially to deodorize and sterilize air by process claimed in Claim 1, characterised in that it is composed of an elongated horizontal envelope, said envelope being open at its ends and being provided in its centre portion, with a tank intended to contain water and means to keep the level of the water constant and to heat the same water at a constant temperature, the tank being provided at one end with a transverse group or set of ozonizing members and with an air blower, while at the other end it is provided with a duct intended to secure the mixing and the exit of the air rich in hydrogen peroxide vapours.

8. Apparatus constructed and adapted to operate substantially as described with reference to Figs. 1 and 2 of the accompanying drawings.

9. Apparatus constructed and adapted to operate substantially as described with

reference to Figs. 3 and 4 of the accompanying drawings.

10. A process for deodorizing and sterilizing air substantially as described.

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Fig. 1

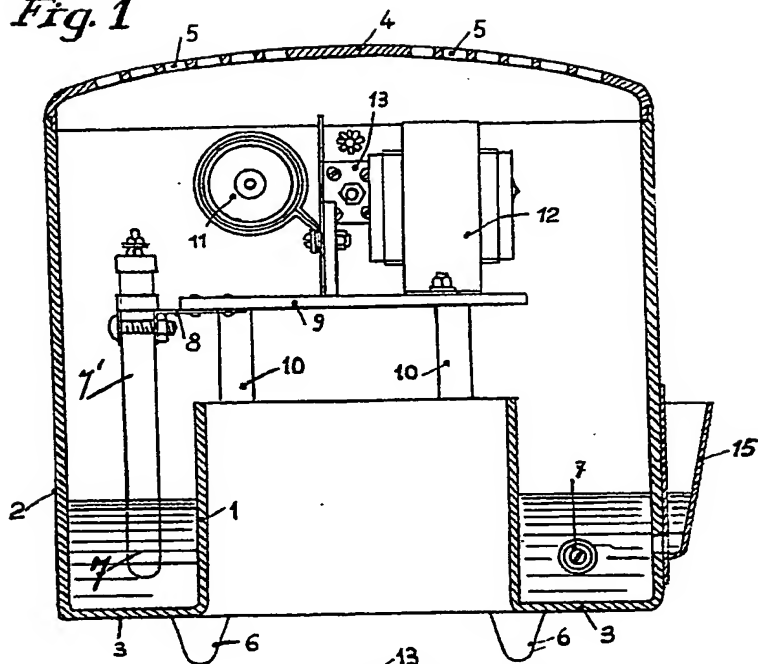
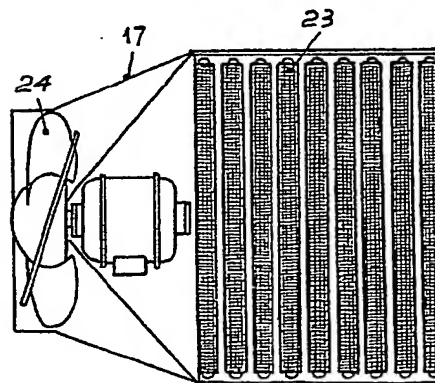
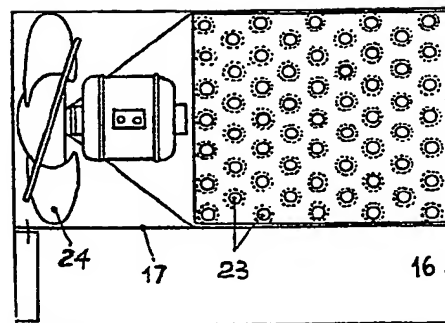
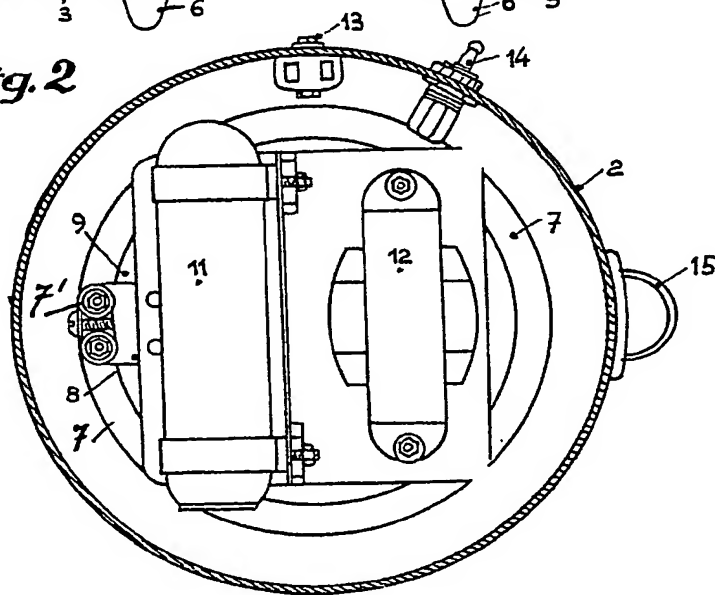


Fig. 2



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 Sheets 1 & 2

Fig. 3

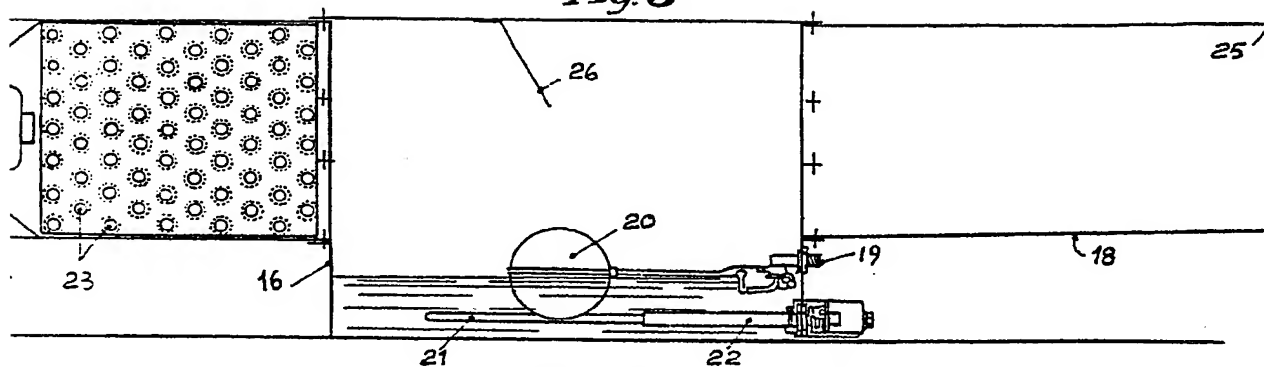
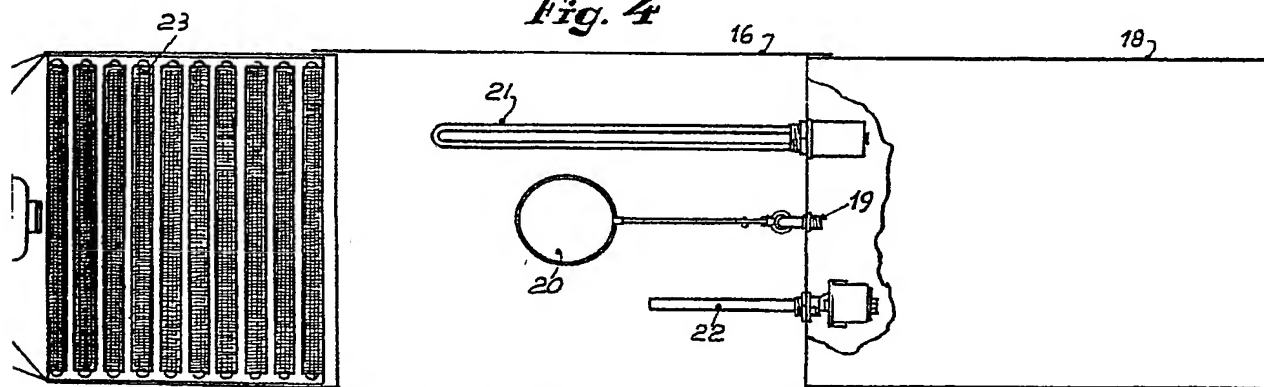
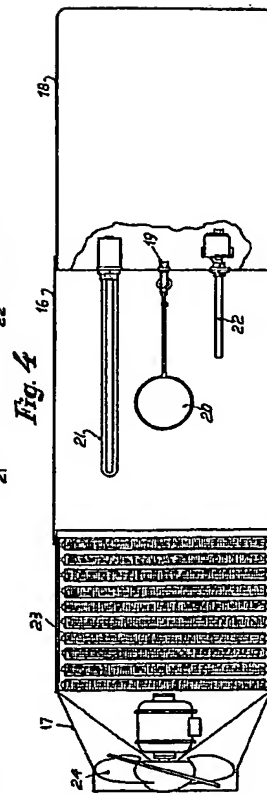
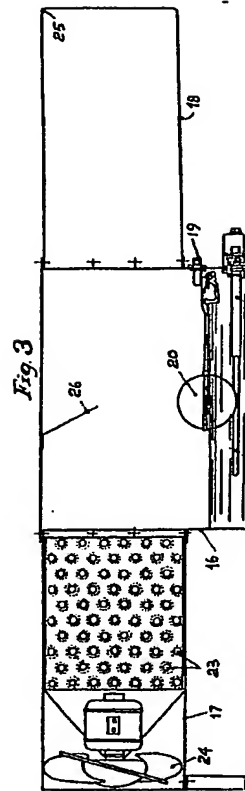
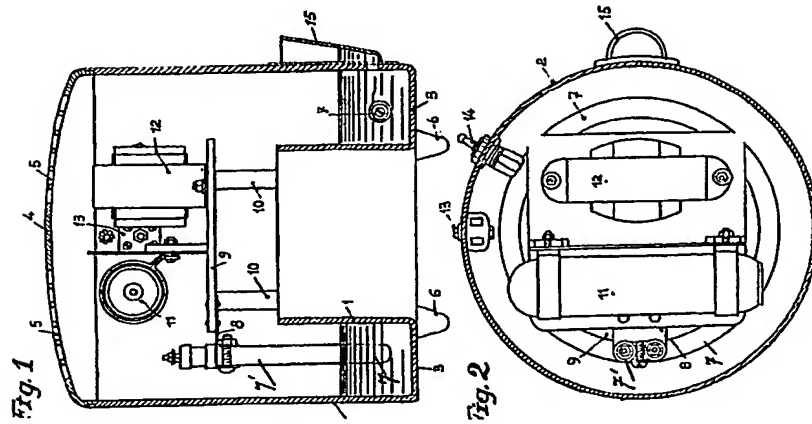


Fig. 4



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